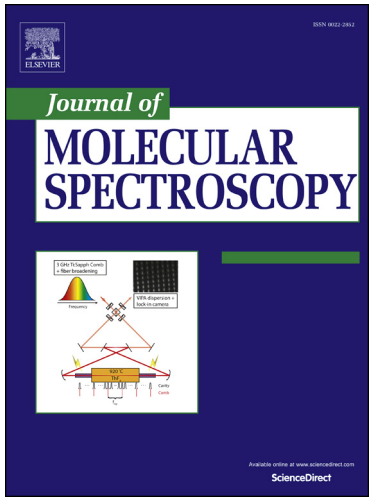

Visible Photodissociation Spectra of Gaseous Rhodamine Ions: Effects of Temperature and Tagging

Rafael Navrátil, Juraj Jaš ík, Jana Roithová

PII: S0022-2852(16)30298-3
DOI: http://dx.doi.org/10.1016/j.jms.2016.10.016
Reference: YJMSP 10798

To appear in: *Journal of Molecular Spectroscopy*

Received Date: 3 August 2016
Revised Date: 7 October 2016
Accepted Date: 27 October 2016

Please cite this article as: R. Navrátil, J. Jaš ík, J. Roithová, Visible Photodissociation Spectra of Gaseous Rhodamine Ions: Effects of Temperature and Tagging, *Journal of Molecular Spectroscopy* (2016), doi: http://dx.doi.org/10.1016/j.jms.2016.10.016

Visible Photodissociation Spectra of Gaseous Rhodamine Ions: Effects of Temperature and Tagging

Rafael Navrátil,[‡] Juraj Jašík,[‡] and Jana Roithová*[‡]

[‡]Department of Organic Chemistry, Faculty of Science, Charles University, Hlavova 2030/8, 12843 Prague 2, Czech Republic

Highlights:

- Comparison of He, Ar and N_2 tagging Vis spectra of Rhodamine 123 demonstrates a negligible effect of the tagging
- He and Ar tagging spectra show a resolved F-C envelope contrary to bare VisPD spectra
- VisPD spectra measured at room temperature are dominated by the absorption of vibrationally excited ions

Abstract

This paper reports on the effect of He, Ar, and N_2 tagging on visible photodissociation (VisPD) spectra of Rhodamine 123 ions. We show that the effect of tagging on the determination of the 0-0 transition in the electronic spectra is negligible. In contrast to the photodissociation spectra of the bare ions, the tagging method provides resolved Franck-Condon envelopes. Ar and N_2 tagging spectra revealed minor blue-shifts (~ 0.5 nm) for some maxima in the Franck-Condon envelope with respect to the He tagging spectrum. The N_2 VisPD spectrum was less resolved compared to He and Ar tagging spectra. Further, we have investigated the effect of temperature on photodissociation spectra of bare rhodamine ions. At room temperature, the absorption spectrum is dominated by the absorption of vibrationally excited ions. Vibrationally relaxed ions start to be dominantly sampled at about 150 K. In average, three to four photons are required to induce photodissociation of the rhodamine ions and it is slightly wavelength dependent. We ascribe it to the fluorescence process.

Keywords: Cryogenic ion trap, Fluorescence, Gas-phase, Helium tagging, Ion spectroscopy, Mass spectrometry, Photodissociation

1 Introduction

Rhodamine dyes are useful because of their luminescence properties [1]. They have ample of applications as fluorescence labels [2,3]. Fluorescence of the rhodamine ions was